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Parker, III et al.

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(54) **INTEGRATING A WEB-BASED CRM SYSTEM WITH A PIM CLIENT APPLICATION**

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G06Q 10/10	(2012.01)
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G06Q 30/02	(2012.01)

(52) **U.S. Cl.**

CPC ***G06Q 10/10*** (2013.01); ***G06F 9/4443*** (2013.01); ***G06Q 30/02*** (2013.01)

(58) **Field of Classification Search**

CPC G06F 17/30
USPC 715/221, 201, 203, 744, 746, 752
See application file for complete search history.

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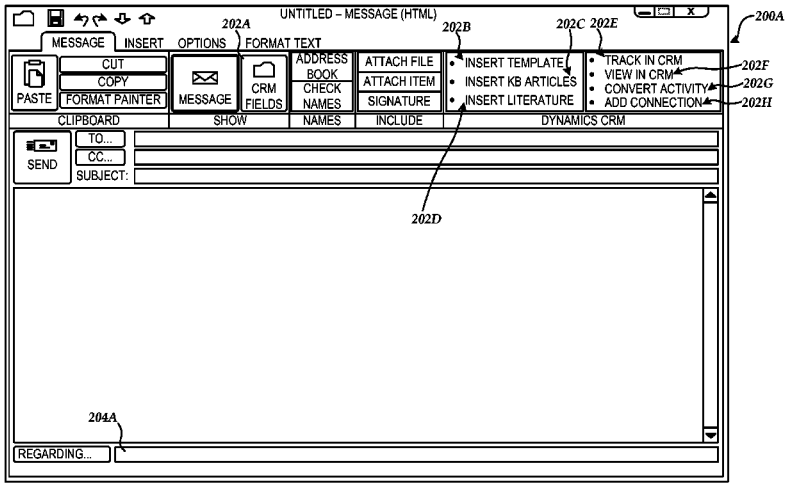
(57) **ABSTRACT**

A customer relationship management (CRM) system utilizes a form definition, user interface (UI) definitions, and UI code to generate Web pages for interacting with CRM data. A CRM plug-in is configured to execute in conjunction with a personal information manager (PIM) client application and to utilize the same form definition, UI definitions, and UI code utilized by the CRM system to generate the Web-based CRM interface. The UI definitions are utilized to present UI controls for performing CRM-related functionality in the context of a UI generated by the PIM client application. The UI code utilized by the CRM system to implement Web-based UI controls can be utilized to implement the UI controls in the context of the PIM client application. The form definition utilized by the CRM system might be utilized to display CRM fields in the UI presented by the PIM client application.

20 Claims, 6 Drawing Sheets



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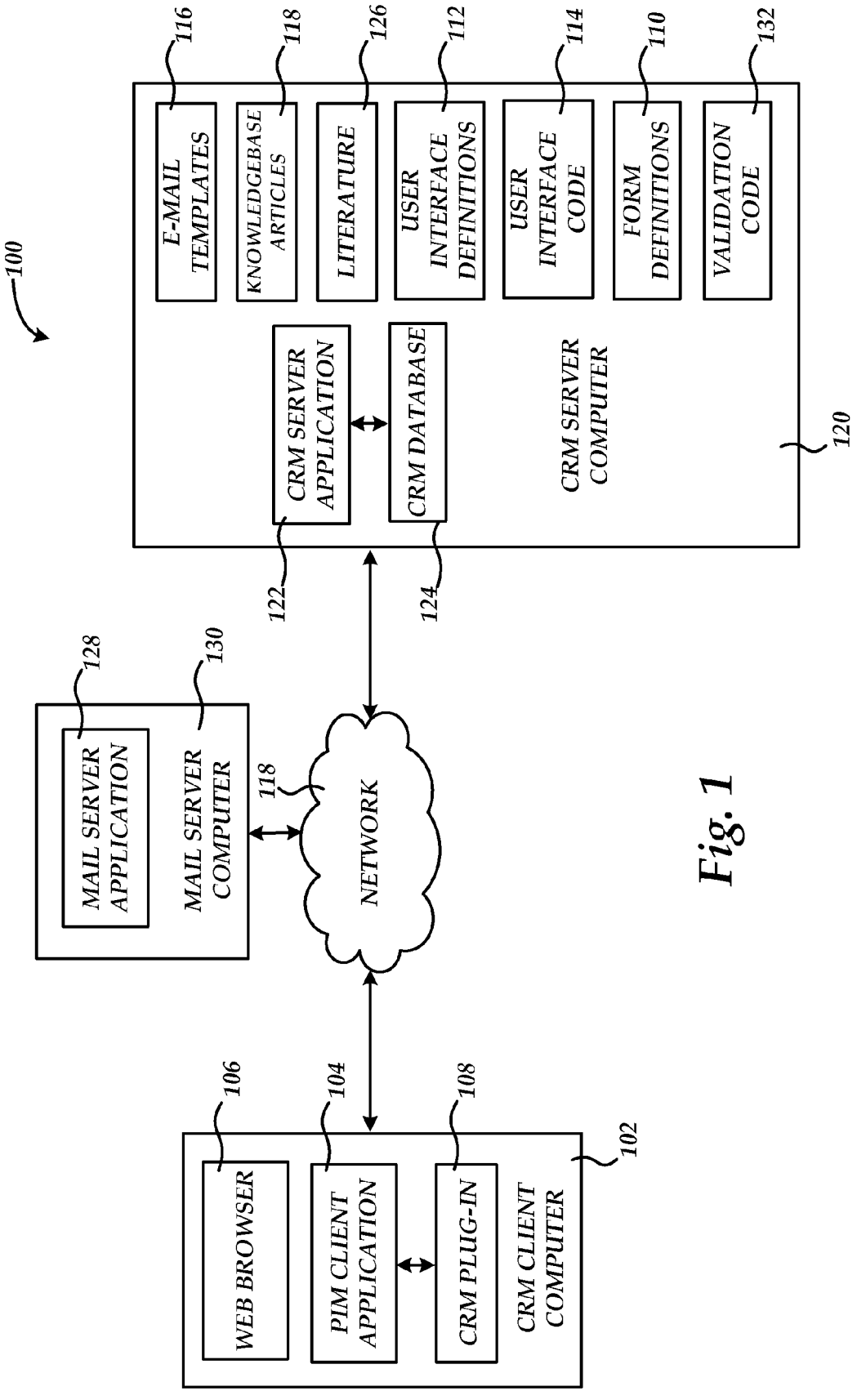
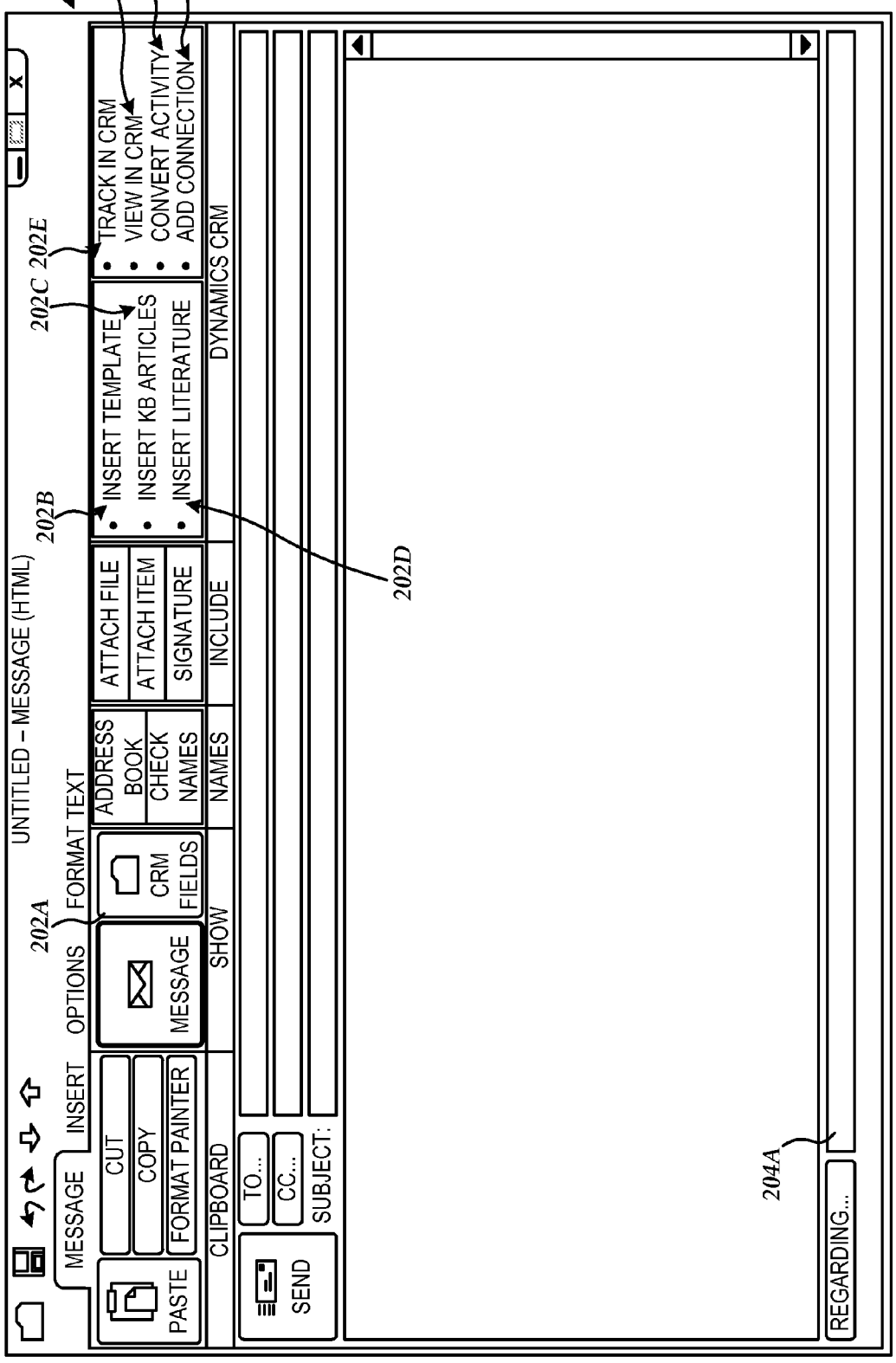

100
116
E-MAIL TEMPLATES
118
KNOWLEDGEBASE ARTICLES
126
LITERATURE
112
USER INTERFACE DEFINITIONS
114
USER INTERFACE CODE
110
FORM DEFINITIONS
132
VALIDATION CODE
CRM SERVER APPLICATION
CRM DATABASE
CRM SERVER COMPUTER
120
122
124
128
MAIL SERVER APPLICATION
130
MAIL SERVER COMPUTER
118
NETWORK
106
WEB BROWSER
104
PIM CLIENT APPLICATION
108
CRM PLUG-IN
CRM CLIENT COMPUTER
102

Fig. 1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PASTE
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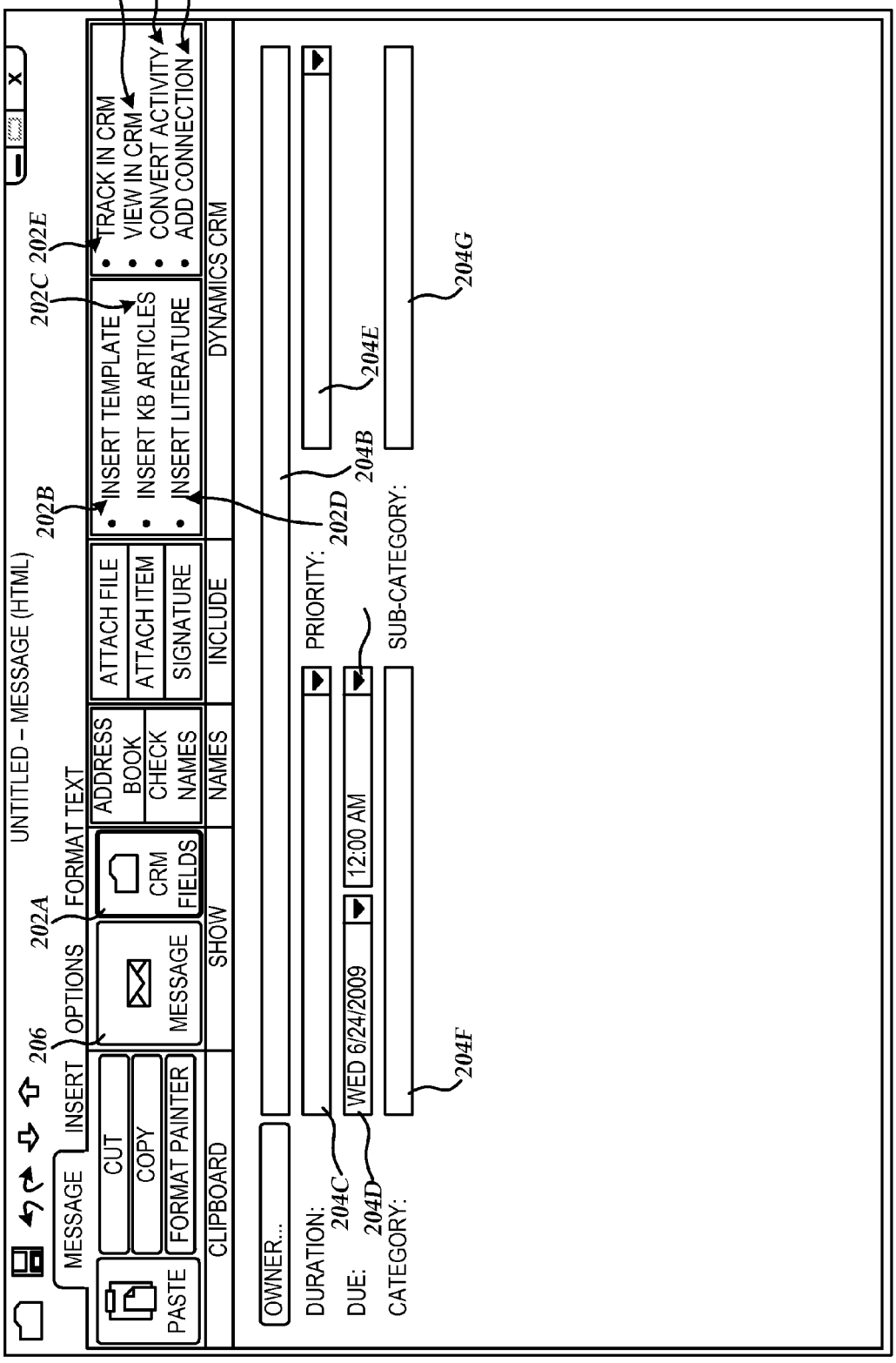
CRM FIELDS
SHOW
ADDRESS BOOK
CHECK NAMES
NAMES
ATTACH FILE
ATTACH ITEM
SIGNATURE
INCLUDE
202B
INSERT TEMPLATE
INSERT KB ARTICLES
INSERT LITERATURE
202C
202E
TRACK IN CRM
VIEW IN CRM
CONVERT ACTIVITY
ADD CONNECTION
202F
202G
202H
DYNAMICS CRM
202D
SEND
TO...
CC...
SUBJECT:
204A
REGARDING...

Fig. 2A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MESSAGE
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206
202A
PASTE
CUT
COPY
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MESSAGE
CRM FIELDS
ADDRESS BOOK
CHECK NAMES
ATTACH FILE
ATTACH ITEM
SIGNATURE
INSERT TEMPLATE
INSERT KB ARTICLES
INSERT LITERATURE
TRACK IN CRM
VIEW IN CRM
CONVERT ACTIVITY
ADD CONNECTION
202B
202C
202E
202F
202G
202H
CLIPBOARD
SHOW
NAMES
INCLUDE
DYNAMICS CRM
OWNER...
DURATION:
DUE:
CATEGORY:
PRIORITY:
SUB-CATEGORY:
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202D
204A
204B
204C
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204E
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204G

Fig. 2B

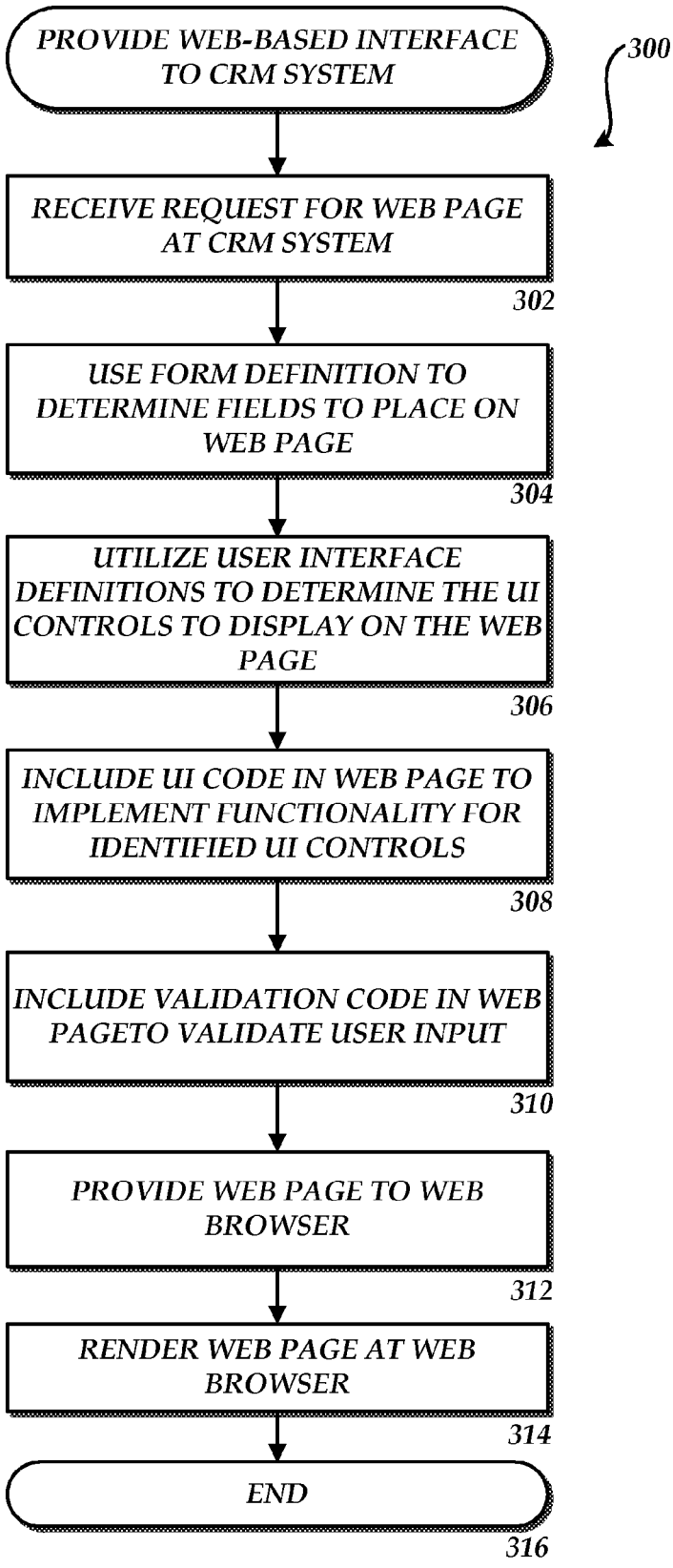
PROVIDE WEB-BASED INTERFACE TO CRM SYSTEM
300
RECEIVE REQUEST FOR WEB PAGE AT CRM SYSTEM
302
USE FORM DEFINITION TO DETERMINE FIELDS TO PLACE ON WEB PAGE
304
UTILIZE USER INTERFACE DEFINITIONS TO DETERMINE THE UI CONTROLS TO DISPLAY ON THE WEB PAGE
306
INCLUDE UI CODE IN WEB PAGE TO IMPLEMENT FUNCTIONALITY FOR IDENTIFIED UI CONTROLS
308
INCLUDE VALIDATION CODE IN WEB PAGETO VALIDATE USER INPUT
310
PROVIDE WEB PAGE TO WEB BROWSER
312
RENDER WEB PAGE AT WEB BROWSER
314
END
316

Fig. 3

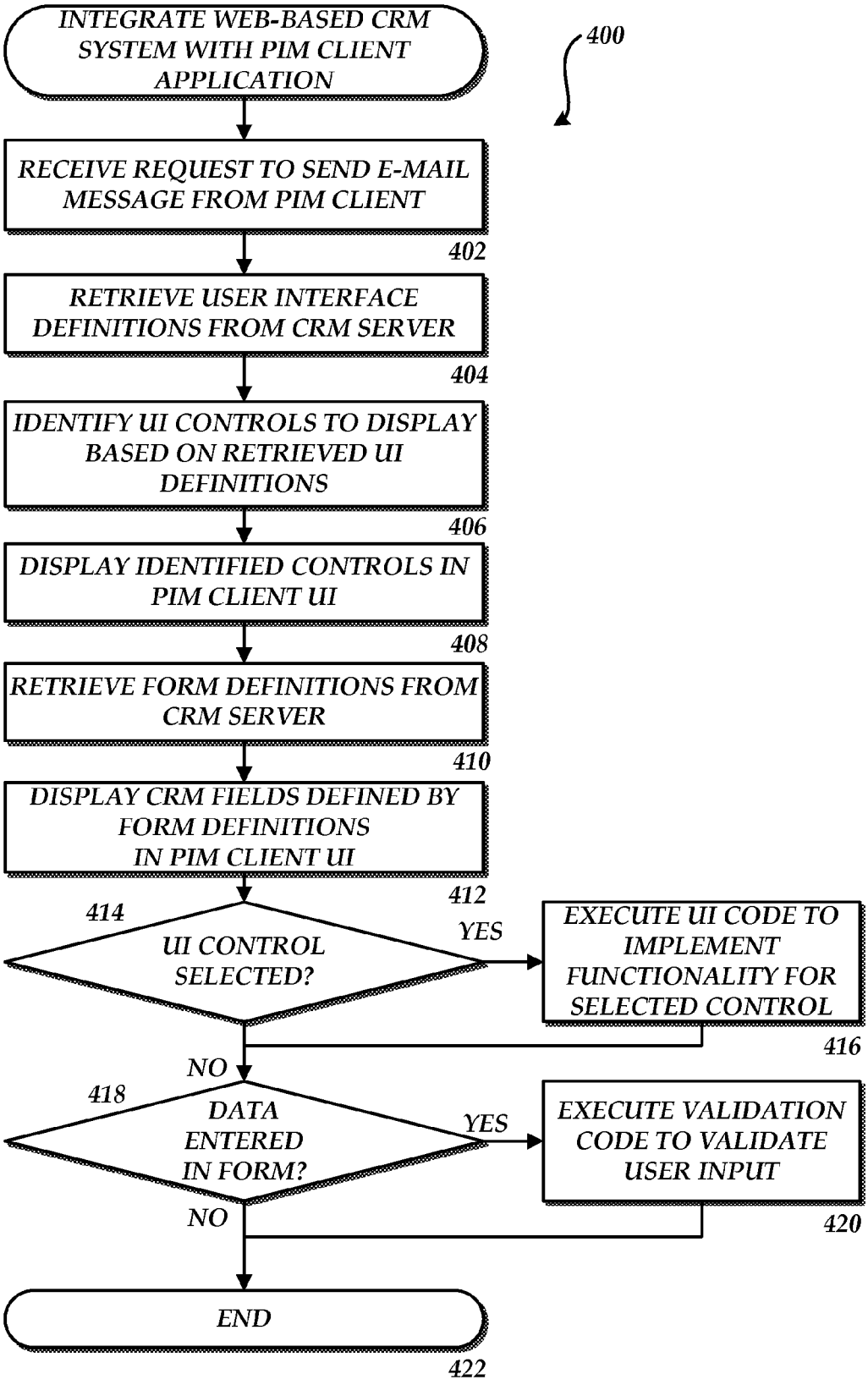
INTEGRATE WEB-BASED CRM SYSTEM WITH PIM CLIENT APPLICATION
400
RECEIVE REQUEST TO SEND E-MAIL MESSAGE FROM PIM CLIENT
402
RETRIEVE USER INTERFACE DEFINITIONS FROM CRM SERVER
404
IDENTIFY UI CONTROLS TO DISPLAY BASED ON RETRIEVED UI DEFINITIONS
406
DISPLAY IDENTIFIED CONTROLS IN PIM CLIENT UI
408
RETRIEVE FORM DEFINITIONS FROM CRM SERVER
410
DISPLAY CRM FIELDS DEFINED BY FORM DEFINITIONS IN PIM CLIENT UI
412
414
UI CONTROL SELECTED?
YES
EXECUTE UI CODE TO IMPLEMENT FUNCTIONALITY FOR SELECTED CONTROL
416
NO
418
DATA ENTERED IN FORM?
YES
EXECUTE VALIDATION CODE TO VALIDATE USER INPUT
420
NO
END
422

Fig. 4

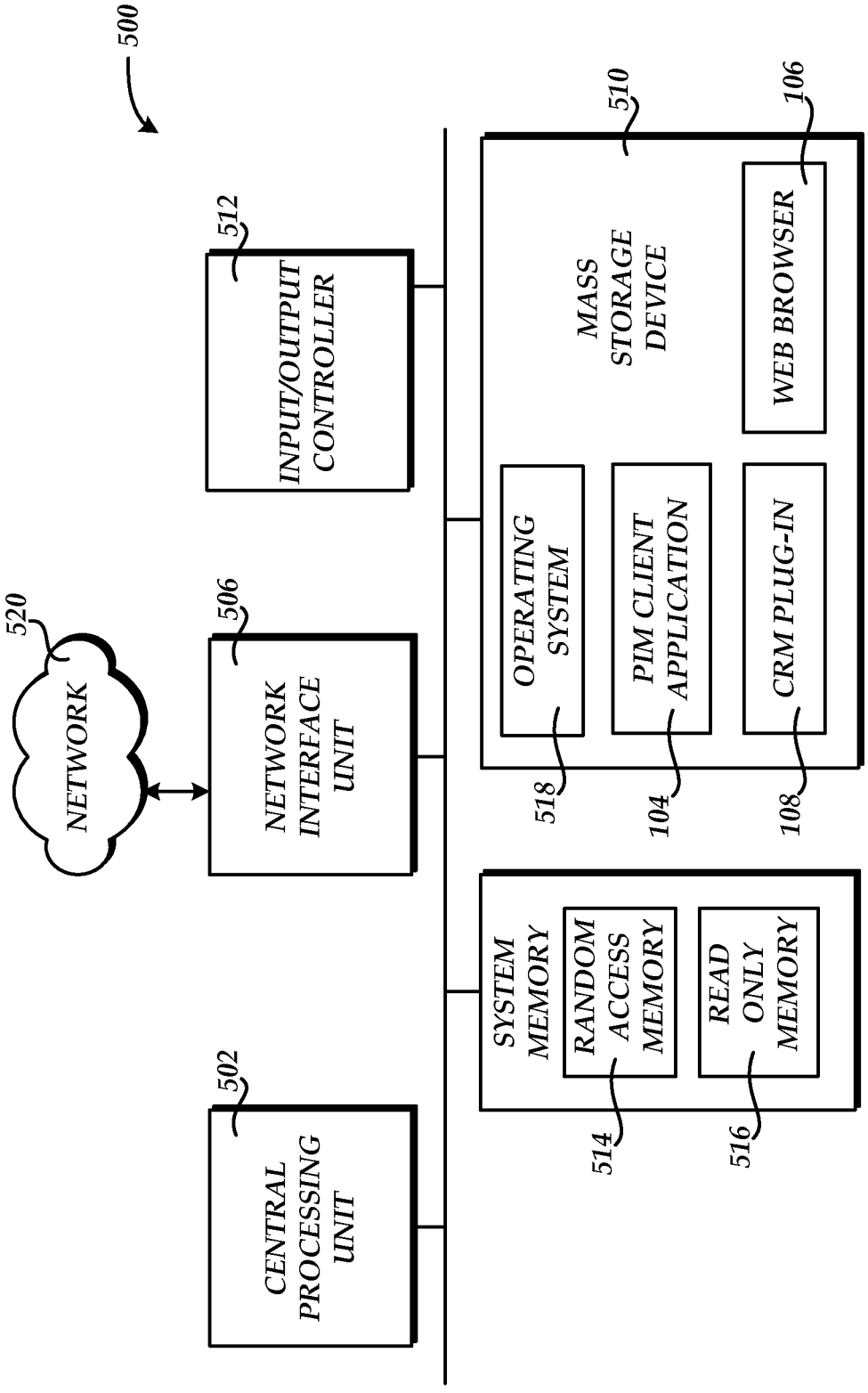
500
512
INPUT/OUTPUT CONTROLLER
510
MASS STORAGE DEVICE
106
WEB BROWSER
520
NETWORK
506
NETWORK INTERFACE UNIT
OPERATING SYSTEM
PIM CLIENT APPLICATION
CRM PLUG-IN
518
104
108
SYSTEM MEMORY
RANDOM ACCESS MEMORY
READ ONLY MEMORY
514
516
502
CENTRAL PROCESSING UNIT

Fig. 5

INTEGRATING A WEB-BASED CRM SYSTEM WITH A PIM CLIENT APPLICATION

BACKGROUND

Customer relationship management ("CRM") systems allow users to create and utilize information relevant to business relationships. For instance, a CRM system may allow users to create, view, edit, modify, and otherwise utilize information regarding customers or potential customers, contact with the customers, sales made to customers, customer support information, marketing information, and other types of information that may be relevant to a business relationship or potential business relationship. CRM systems typically provide a World Wide Web ("Web") based user interface ("UI") for performing this functionality. As an example, a CRM system might provide a Web-based UI through which a user can send electronic mail ("e-mail") messages to customers or potential customers, manage appointments with customers, and perform other business tasks.

While the Web-based UIs provided by most CRM systems are robust, many users still prefer to utilize a personal information manager ("PIM") client application program to send and receive e-mail, to manage appointments, and to perform other customer-related tasks. Currently, however, users typically have to choose between leveraging the features provided by Web-based CRM systems, such as e-mail templates, and the rich e-mail experience provided by PIM client application programs. For instance, some users might compose new e-mail messages using a PIM client application, and then utilize the Web UI provided by a CRM system to perform actions on the e-mail messages. Using both a PIM client application and a Web-based CRM system can be a time consuming and frustrating process for some users.

It is with respect to these and other considerations that the disclosure made herein is presented.

SUMMARY

Technologies are described herein for integrating a Web-based CRM system and a PIM client application. Through the utilization of the technologies and concepts presented herein, the functionality provided by a Web-based UI generated by a CRM system may be integrated within a UI provided by a PIM client application program. In this manner, a user of the PIM client application can perform actions on CRM data directly within the PIM client application without having to utilize the Web-based UI provided by the CRM system.

According to one aspect presented herein, a CRM system utilizes a form definition, UI definitions, UI code, and validation code to generate Web pages for accessing and interacting with CRM data. For instance, the CRM system might generate a Web page for sending an e-mail message to a customer. The form definition defines one or more CRM fields to be provided in the e-mail message. The UI definitions define one or more UI controls for performing CRM-related functionality that should be presented in the Web page. The UI code comprises code for implementing the functionality provided by the UI controls when selected. The validation code comprises code for validating data entered into the CRM fields on the Web page.

In order to enable CRM functionality within the PIM client application, a CRM plug-in may be executed in conjunction with the PIM client application in one embodiment. The CRM plug-in is configured to utilize the same form definition, UI definitions, UI code, and validation code utilized by the CRM system to generate the Web-based CRM interface. For instance, when a new CRM-related e-mail message is created within the PIM client application, the UI definitions might be utilized to present UI controls for performing CRM-related functionality. When a UI control is selected, the same UI code utilized by the CRM system to implement Web-based UI controls can be utilized to implement the functionality provided by the selected UI control in the context of the PIM client application.

According to other aspects, the form definition utilized by the CRM system to generate fields in a Web page might be utilized to display CRM fields in the UI presented by the PIM client application. For instance, CRM fields for inputting and displaying CRM data can be displaying along with standard e-mail fields (e.g. to:, cc:, subject, etc.) in an e-mail message. The validation code utilized by the CRM system when validating input made to Web pages might also be utilized in the context of the PIM client application to validate data input into the CRM fields. Data entered into the CRM fields can be posted to the CRM system for storage and the e-mail message can be associated with CRM objects maintained by the CRM system. These concepts might also be utilized with other UIs presented by the PIM client application, such as UIs for creating and managing appointments, and others.

It should be appreciated that the above-described subject matter may also be implemented as a computer-controlled apparatus, a computer process, a computing system, or as an article of manufacture such as a computer-readable storage medium. These and various other features will be apparent from a reading of the following Detailed Description and a review of the associated drawings.

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended that this Summary be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a computer network architecture diagram showing aspects of several computing systems provided in embodiments disclosed herein;

FIGS. **2**A-**2**B are user interface diagrams showing aspects of a UI provided by a PIM client application and a CRM plug-in in one embodiment presented herein;

FIG. **3** is a flow diagram illustrating aspects of the operation of a CRM server computer and a PIM client application according to one embodiment disclosed herein;

FIG. **4** is a flow diagram illustrating aspects of the operation of a CRM client plug-in according to one embodiment disclosed herein; and

FIG. **5** is a computer architecture diagram showing an illustrative computer hardware and software architecture for a computing system capable of implementing the embodiments presented herein.

DETAILED DESCRIPTION

The following detailed description is directed to concepts and technologies for integrating a Web-based CRM system and a PIM client application. A CRM system utilizes form definitions, UI definitions, and UI code to generate Web pages for interacting with CRM data. A CRM plug-in is configured to execute in conjunction with a PIM client application and to

utilize the same form definitions, UI definitions, and UI code utilized by the CRM system to generate the Web-based CRM interface. The UI definitions are utilized to present UI controls for performing CRM-related functionality in the context of a UI generated by the PIM client application. The UI code utilized by the CRM system to implement Web-based UI controls can be utilized to implement the UI controls in the context of the PIM client application. The form definition utilized by the CRM system might be utilized to display CRM fields in the UI presented by the PIM client application.

While the subject matter described herein is presented in the general context of program modules that execute in conjunction with the execution of an operating system and application programs on a computer system, those skilled in the art will recognize that other implementations may be performed in combination with other types of program modules. Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the subject matter described herein may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, and the like.

In the following detailed description, references are made to the accompanying drawings that form a part hereof, and which are shown by way of illustration specific embodiments or examples. Referring now to the drawings, in which like numerals represent like elements through the several figures, aspects of a computing system, methodology, and computer-readable storage medium for integrating a Web-based CRM system and a PIM client application will be described.

Turning now to FIG. **1**, details will be provided regarding one embodiment presented herein for integrating a Web-based CRM system and a PIM client application. In particular, FIG. **1** is a network diagram showing one illustrative operating environment **100** for the embodiments presented herein. As shown in FIG. **1**, the environment **100** includes a CRM client computer **102** that is coupled to a CRM server computer **120** by way of a network **118**. The CRM client computer **102** comprises a standard desktop, laptop, or other type of computing device configured to execute a PIM client application **104** and a CRM plug-in **108**.

The PIM client application **104** comprises a program for viewing, managing, and otherwise interacting with personal information, such as electronic mail messages, contacts, a calendar, tasks, notes, to do list items, and other personal information that may be maintained by a user of the CRM client computer **102**. The PIM client application **104** may maintain a database storing the personal information. The PIM client application **104** may also interact with one or more server computers that also store a database containing a user's personal information.

According to embodiments, the PIM client application **104** may be configured to provide functionality for sending and receiving e-mail messages. For instance, the PIM client application **104** might provide a UI for allowing a user to create a new e-mail message. The PIM client application **104** might also allow the user to send the e-mail message to a desired recipient through one or more e-mail server computers, such as the mail server computer **130** that executes the mail server application **128**. The PIM client application **104** might also provide functionality for allowing the user to create calendar items, maintain a contacts list, create to do list items, and to perform other functions. In one embodiment, the PIM client application **104** comprises the OUTLOOK PIM client application from MICROSOFT CORPORATION. It should be appreciated that the technologies disclosed herein might be implemented with other PIM client applications. The technologies presented herein might also be implemented with other types of client applications other than PIM client applications.

The CRM client computer **102** may also execute a Web browser **106** in one embodiment. As known to those skilled in the art, the Web browser **106** is a computer program that is configured to request, receive, and render Web pages and associated content. For instance, in one implementation, the CRM server computer **120** (which may be referred to herein as the "CRM system") is configured to execute a CRM server application **122** that provides a Web-based interface to CRM data. As discussed briefly above, CRM data refers to any data maintained by an organization that is relevant to an existing or potential customer relationship. For instance, CRM data may include, but is not limited to, information regarding customers, contact with the customers, sales made to customers, customer support information, marketing information, and other types of information that may be relevant to a customer relationship or potential customer relationship.

Through the use of the Web browser **106**, a user of the CRM client computer **102** may utilize the Web-based CRM functionality provided by the CRM server computer **120**. As an example, the CRM server computer **120** might provide a Web-based UI through which a user of the CRM client computer **102** can send e-mail messages to customers or potential customers, manage appointments with customers, and perform other business tasks. The Web-based UI provided by the CRM server computer **120** might also provide functionality for performing other CRM-related tasks. Additional details regarding the provision of a Web-based UI for performing CRM tasks by the CRM server computer will be provided below with regard to FIG. **3**.

According to one implementation, the PIM client application **104** is also configured to execute in conjunction with a CRM plug-in **108**. The CRM plug-in **108** operates in conjunction with the PIM client application **104** to provide functionality for allowing a user of the CRM client computer **102** to view, modify, and otherwise interact with CRM data. The functionality provided by the CRM plug-in **108** may be integrated with the operation of the PIM client application **104** such that a user interface provided by the CRM server computer **120** is integrated with a user interface provided by the PIM client application **104**. In this manner, a user of the CRM client computer **102** may access, view, and modify CRM data directly from within the PIM client application **104** utilizing the functionality provided by the CRM plug-in **108**.

The CRM plug-in **108** is configured to operate in conjunction with the CRM server application **122** executing on the CRM server computer **120**. As discussed briefly above, the CRM server computer **120** provides functionality for allowing users to create and utilize CRM data. The CRM server computer **120** is a standard server computer configured to execute the CRM server application **122** and, potentially, other applications. As illustrated in FIG. **1**, the CRM server application **122** maintains a CRM server database **124**. The CRM server database **124** is utilized to store CRM data. Through the functionality provided by the CRM plug-in **108**, a user of the CRM client computer **102** can retrieve, view, and modify CRM data stored in the CRM server database **124**.

According to one embodiment, the Web-based UI provided by the CRM server computer **102** and the PIM client application **104** are integrated. In particular, the functionality provided by the Web-based UI generated by a CRM server computer **120** is integrated within a UI provided by the PIM client

application **104**. In this manner, a user of the PIM client application **104** can perform actions on CRM data directly within the PIM client application **104** without having to utilize a Web browser application program to access the Web-based UI provided by the CRM server computer **120**.

In order to provide the functionality disclosed herein, the CRM plug-in **108** may utilize one or more application programming interfaces ("APIs") exposed by the PIM client application **104**. For instance, the CRM plug-in is configured in one embodiment to display UI controls for performing CRM functions in an "inspector" UI generated by the PIM client application **104**. As an example, when a user of the CRM client computer **102** creates a new e-mail message, the PIM client application **104** might display a UI interface for inspecting and setting the properties of the e-mail message (referred to herein as an "inspector"). When such a UI is displayed, the CRM plug-in **108** might utilize public APIs exposed by the PIM client application **104** to cause UI controls for performing CRM functions to be displayed in the inspector UI. In the event that CRM fields already exist in the PIM application, those fields might be utilized by mapping the existing CRM data into those fields. In this manner, the user is permitted to utilize the potentially more familiar PIM application controls as opposed to the CRM fields generated by the CRM plug-in.

The CRM plug-in **108** might also utilize one or more public APIs exposed by the PIM client application **104** to cause data fields for viewing and entering CRM data, referred to herein as "CRM fields," to be displayed within the inspector UI. A user of the CRM client computer **102** can then enter data in the CRM fields. The provided data may then be published to the CRM server application **122** and stored in the CRM database **124**. Additional details regarding various processes by which the CRM plug-in **108** causes UI controls and CRM fields to be displayed in an inspector UI generated by the PIM client application **104** will be described below with regard to FIG. **4**. It should be appreciated that while an inspector UI for creating an e-mail message is utilized herein to illustrate the disclosed embodiments, inspector UIs and other types of UIs for inspecting other types of data might also be utilized. For instance, inspectors displayed by the PIM client application **104** for inspecting contacts, meetings, to do items, might also be utilized in conjunction with the embodiments disclosed herein.

It should be appreciated that, while the embodiments described herein have been presented in the context of a CRM plug-in **108** that executes in conjunction with a CRM server application **122**, the embodiments presented herein might be utilized with any business application plug-in. A business plug-in is a plug-in that operates in conjunction with a PIM client application **104** to access any kind of business data. Additionally, it should also be appreciated that the embodiments presented herein might be utilized in other types of operating environments. For instance, the functionality described herein might be utilized by a standalone application for interacting with CRM or other types of business data that does not utilize a plug-in component. The functionality presented herein might also be integrated directly within the PIM client application **104**. Other types of implementations will also be apparent to those skilled in the art.

As shown in FIG. **1**, the CRM client computer **102** and the CRM server computer **120** communicate over the network **118**. The network **118** is a computing network configured for enabling data communications between the CRM client computer **102** and the CRM server computer **120**. In one embodiment, the network **118** comprises the Internet, however, it should be appreciated that the network **118** may comprise any type of local area or wide area network. Additionally, the network **118** has been shown in a simplified form. Therefore, it should be appreciated that the network **118** may comprise many different networking components and computer systems distributed over a large geographic area. It should also be appreciated that although FIG. **1** illustrates only a single CRM client computer **102** and a single CRM server computer **120** being connected to the network **118**, many other computing devices may also be connected to the network **118** and enabled for data communication over the network **118**.

Referring now to FIGS. **2**A and **2**B, several user interface diagrams showing aspects of a UI **200**A-**200**B provided by the PIM client application **104** and the CRM plug-in **108** will be described. In particular, FIG. **2**A shows an inspector UI **200**A generated by the PIM client application **104**. The example UI **200**A shown in FIG. **2**A is generated by the PIM client application **104** in response to receiving a request from a user of the CRM client computer **102** to create a new e-mail message. The UI **200**A includes a number of standard user interface controls and native fields that are typically provided when a user requests to create a new e-mail message. For instance, the UI **200**A includes UI controls for attaching files, inserting a signature, checking names, and for performing other functions. The UI **200**A also shows native e-mail fields for specifying one or more e-mail addresses for the recipient of the e-mail message, carbon copy recipients, and a subject for the new e-mail message.

In addition to the UI controls and e-mail fields generated by the PIM client application **104**, the UI **200**A also includes a number of UI controls **202**A-**202**H that have been generated by the CRM plug-in **108**. As discussed above, the CRM plug-in **108** might utilize one or more APIs exposed by the PIM client application **104** to cause the UI controls **202**A-**202**H to be displayed in the UI **200**A. The UI controls **202**B-**202**H provide functionality for performing CRM-related tasks with respect to the newly created e-mail message. For instance, the UI control **202**B will cause an e-mail template **116** to be inserted into the new e-mail message when selected. The UI control **202**C will cause a knowledgebase article **118** to be inserted into the new e-mail message when selected. The UI control **202**D will cause literature **126** to be inserted or attached to the new e-mail message. For instance, sales literature or other types of documents might be attached to the e-mail message through the selection of the UI control **202**D. As discussed above, in the event that CRM fields already exist in the PIM application, those fields might be utilized by mapping the existing CRM data into those fields. This prevents duplication of fields and allows a user to work within the UI provided directly by the PIM client application **104** whenever possible.

Selection of the UI control **202**E will cause the new e-mail message to be tracked by the CRM server application **122**. Selection of the UI control **202**F will cause a CRM object maintained by the CRM server application **122** corresponding to the new e-mail message to be displayed. For instance, a Web page provided by the CRM server application **122** showing details about the corresponding CRM object may be displayed by the Web browser **106**. The UI control **202**G will cause the newly created e-mail message to be converted to a CRM activity in the CRM database **124**. For instance, the newly created e-mail message might be converted to a follow-up object indicating that a follow-up should be made with a customer that is the subject of the e-mail message. The UI control **202**H may be selected in order to correlate one CRM entity with another CRM entity. For instance, the e-mail message that is the subject of the UI **200**A may be correlated with another CRM object in the CRM database **124**.

It should be appreciated that the UI controls **202**B-**202**H are merely illustrative and that fewer or additional UI controls might also be displayed within the UI **200**A utilizing the technologies presented herein. Additional details regarding the various processes utilized by the CRM plug-in **108** to cause the UI controls **202**B-**202**H to be displayed within the UI **200**A provided by the PIM client application **104** will be described below with reference to FIG. **4**.

As also shown in FIG. **2**A, a CRM field **204**A has also been displayed by the CRM plug-in **108** in the UI **200**A generated by the PIM client application **104**. As discussed briefly above, the PIM client application **104** might utilize one or more APIs exposed by the Web browser **106** and the PIM client application **104** to display CRM data fields for viewing and entering CRM data. In the UI **200**A, the CRM plug-in **108** has caused the PIM client application **104** to display the field **204**A. The field **204**A can be utilized to specify CRM data that indicates what the e-mail message that is the subject of the UI **200**A is regarding. Additionally, the UI control **202**A may also be selected in order to view other CRM fields that may be specified in conjunction with the newly created e-mail message. When the UI control **202**A is selected, the user interface **200**B shown in FIG. **2**B is displayed by the PIM client application **104**.

The UI **200**B shown in FIG. **2**B includes the UI controls **202**A-**202**H. The UI **200**B also includes a number of additional CRM fields **204**B-**204**G. As discussed above, the CRM fields **204**B-**204**G correspond to CRM data stored in the CRM database **124**. The CRM fields **204**B-**204**G may be utilized by a user of the CRM client computer **102** to add additional CRM data to the newly created e-mail message. The data specified by way of the CRM fields **204**B-**204**G and mapped PIM fields can be stored in the CRM database **124**. A user may select the UI controls **206** to return to the UI **200**A shown in FIG. **2**A.

As will be described in greater detail below with respect to FIG. **4**, the CRM plug-in **108** utilizes the same components in order to cause the PIM client application **104** to display the user interface controls **202**A-**202**H and the CRM fields **204**A-**204**G that the CRM server application **122** utilizes to provide a Web-based user interface for creating a new e-mail message. By utilizing the same components, the user interface provided by the PIM client application **104** can provide functionality that is consistent with the functionality provided by the CRM server application **122**. Additional details regarding the processes by which the CRM plug-in **108** utilizes components that are also utilized by the CRM server application **122** to provide a Web-based UI will be provided below with respect to FIGS. **3**-**4**.

Turning now to FIG. **3**, additional details will be provided regarding the embodiments presented herein for integrating a Web-based CRM system and a PIM client application. In particular, FIG. **3** is a flow diagram showing a routine **300** that shows aspects of the operation the CRM server computer **120** for providing a Web-based UI for performing CRM tasks in one embodiment disclosed herein. FIG. **3** will be described in conjunction with FIG. **1**.

It should be appreciated that the logical operations described herein are implemented (1) as a sequence of computer implemented acts or program modules running on a computing system and/or (2) as interconnected machine logic circuits or circuit modules within the computing system. The implementation is a matter of choice dependent on the performance and other requirements of the computing system. Accordingly, the logical operations described herein are referred to variously as operations, structural devices, acts, or modules. These operations, structural devices, acts and modules may be implemented in software, in firmware, in special purpose digital logic, and any combination thereof. It should also be appreciated that more or fewer operations may be performed than shown in the figures and described herein. These operations may also be performed in a different order than those described herein.

The routine **300** begins at operation **302**, where the CRM server application **122** receives a request for a Web page. For instance, the CRM server application **122** may receive a request from the Web browser **106** for a Web page for sending a new e-mail message. In response to receiving such a request, the CRM server application **122** utilizes the form definitions **110** to determine the fields that should be placed in the Web page. For instance, the form definitions **110** may specify that the CRM fields **204**A-**204**G are to be included on the Web page for creating a new e-mail message. Once the CRM server application **122** has determined the fields to be placed on the Web page, the routine **300** proceeds from operation **304** to operation **306**.

At operation **306**, the CRM server application **122** utilizes the user interface definitions **112** to determine the UI controls to be displayed on the Web page. The UI definitions **112** might specify that the UI controls **202**B-**202**H should be displayed on the Web page for creating the e-mail message. From operation **306**, the routine **300** proceeds to operation **308** where the CRM server application **122** includes UI code **114** in the Web page for implementing the functionality for the UI controls identified at operation **306**. For instance, script code for implementing the functionality behind the UI controls might be included in the Web page. Other types of code for implementing the UI controls might also be generated and inserted into the Web page.

From operation **308**, the routine **300** proceeds to operation **310** where the CRM server application **122** includes validation code **132** in the Web page. The validation code **132** comprises program code for validating user input into the fields displayed on the Web page. For instance, the validation code **132** might comprise scripts or other types of executable code configured to impose certain restrictions on the types of data that might be entered by way of the CRM fields shown in the Web page.

Once the Web page has been generated by the CRM server application **122**, the Web page is provided to the Web browser **106** at operation **312**. As discussed above, the Web page includes CRM fields specified by the form definitions **110**, UI controls specified by the UI definitions **112**, UI code **114** for implementing the UI controls, and, optionally, validation code **132** for validating user input in to the displayed fields.

The Web browser **106** renders the Web page provided by the CRM server application **122** at operation **314**. A user of the CRM client computer **102** may then interact with the Web page by selecting the UI controls, entering data into the CRM fields, and performing other functions. The user may also elect to send the e-mail message defined by way of the Web page through the CRM server application **122**. Data specified by way of the CRM fields may then be stored in the CRM database **124** and the sent e-mail message may be tracked by the CRM server application **122**. From operation **314**, the routine **300** proceeds to operation **316**, where it ends.

Referring now to FIG. **4**, a flow diagram showing a routine **400** that illustrates aspects of the operation of the CRM plug-in **108** for integrating the Web-based CRM server computer **120** and the PIM client application **104** in one embodiment presented herein will be described. FIG. **4** will be described in conjunction with FIGS. **1** and **2**A-**2**B.

The routine **400** begins at operation **402**, where the PIM client application **104** receives a request to send an e-mail

message from the PIM client application **104**. As discussed above, the PIM client application **104** might utilize an e-mail server computer **130** in order to send e-mail messages. In response to receiving the request to send a new e-mail message, the PIM client application **104** displays a UI for creating the new e-mail message. For instance, the UIs **200**A-**200**B shown in FIGS. **2**A-**2**B and described above may be generated. As also discussed above, the UI controls **202**A-**202**H may be displayed within the user interfaces **200**A-**200**B by the CRM plug-in **108**. In order to cause the UI controls **202**A-**202**H to be displayed in the UIs **200**A-**200**B, the CRM plug-in **108** retrieves the UI definitions **112** from the CRM server **120** at operation **404**. The UI definitions **112** are the same UI definitions **112** utilized by the CRM server application **122** to generate the Web-based user interface described above.

Once the CRM plug-in **108** has retrieved the UI definitions **112** from the CRM server computer **120**, the CRM plug-in **108** identifies the UI controls that should be displayed in the UIs **200**A-**200**B based on the retrieved UI definitions **112**. In one embodiment, some UI controls may be pre-defined UI controls that are mandatory and that must be displayed by the CRM plug-in **108**. Other user-defined controls may also be specified within the UI definitions **112**. An administrator of the CRM server computer **120** may specify the user-specified UI controls. According to one embodiment, the CRM plug-in **108** is configured to identify a subset of the UI controls specified by the UI definitions **112**. For instance, the CRM plug-in **108** might identify a subset of the specified controls that is appropriate for inclusion within a particular UI, such as an e-mail inspector UI.

Once the CRM plug-in **108** has identified the UI controls **202**A-**202**H that should be displayed within the UIs **200**A-**200**B, the routine **400** proceeds from operation **406** to operation **408** where the CRM plug-in **108** causes the identified UI controls to be displayed in the UI **200**A-**200**B generated by the PIM client application **104**. As discussed above, the CRM plug-in **108** might utilize one or more public APIs exposed by the PIM client application **104** in order to cause the UI controls **202**A-**202**H to be displayed in the UI **200**A-**200**B.

From operation **408**, the routine **400** proceeds to operation **410** where the CRM plug-in **108** retrieves the form definitions **110** from the CRM server computer **120**. The form definitions **110** retrieved by the CRM plug-in **108** are the same form definitions **110** utilized by the CRM server application **122** to provide the Web-based UI described above. As also discussed above, the form definitions **110** specify the CRM fields **204**A-**204**G that should be displayed by the CRM plug-in **108** within the UI **200**A-**200**B. According to embodiments, the CRM plug-in **108** might identify a subset of the fields specified within the form definitions **110** to be displayed within the UIs **200**A-**200**B. For instance, the CRM plug-in **108** might identify a subset of the specified fields that do not overlap with the fields natively displayed by the PIM client application **104** such as the e-mail recipients, carbon copy recipients, and subject of an e-mail message.

From operation **410**, the routine **400** proceeds to operation **412** where the CRM plug-in **108** causes the PIM client application **104** to display the fields **204**A-**204**G as defined by the form definitions **110** in the UI **200**A-**200**B. The routine **400** then proceeds to operation **414** where a determination is made as to whether one of the UI controls **202**A-**202**H has been selected. If so, the routine **400** proceeds to operation **416** where the UI code **114** is executed in order to implement the functionality provided by the selected UI controls **202**A-**202**H. The UI code **114** executed to implement the functionality provided by the UI control in the context of the PIM client application **104** is the same UI code **114** that is utilized in order to implement UI controls provided by way of the Web user interface provided by the CRM server application **122**. The UI code **114** is implemented within an invisible frame in one embodiment presented herein. From operation **416**, the routine **400** proceeds to operation **418**.

At operation **418**, a determination is made as to whether data has been entered into the CRM fields **204**A-**204**G. If so, the routine **400** proceeds from operation **418** to operation **420**. At operation **420**, the validation code **132** is executed in order to validate the user input. The validation code **132** executed in the context of the PIM client application **104** is the same validation code **132** that executes within the Web browser **106** in order to validate user input provided by way of the Web interface generated by the CRM server application **122**. The validation code **132** is implemented within an invisible frame in one embodiment presented herein.

According to one implementation, the validation code **132** is also configured to validate input made to the native fields displayed by the PIM client application **104** in the UI **200**A-**200**B. For instance, the validation code **132** can be configured to validate input made to the message recipient, carbon copy recipient, and subject fields displayed by the PIM client application **104** in the UIs **200**A-**200**B. From operation **420**, the routine **400** proceeds to operation **422**, where it ends.

It should be appreciated that although the form definitions **110**, UI definitions **112**, UI code **114**, and validation code **132** have been illustrated in FIG. **1** as being stored separately, these components may be stored together. For instance, in one embodiment, a single hypertext markup language ("HTML") document might define the fields to be shown on a Web page, the UI controls to be shown on the page, and include code (such as JAVASCRIPT) for implementing the UI controls and for validating user input. Other implementations might also be utilized.

FIG. **5** shows an illustrative computer architecture for a computer **500** capable of executing the software components described herein for integrating a Web-based CRM system and a PIM client application **104**. The computer architecture shown in FIG. **5** illustrates a conventional desktop, laptop computer, or server computer and may be utilized to execute the CRM plug-in **108**, the PIM client application **104**, the CRM server application **122**, or any of the other software components described herein.

The computer architecture shown in FIG. **5** includes a central processing unit **502** ("CPU"), a system memory **508**, including a random access memory **514** ("RAM") and a read-only memory ("ROM") **516**, and a system bus **504** that couples the memory to the CPU **502**. A basic input/output system ("BIOS") containing the basic routines that help to transfer information between elements within the computer **500**, such as during startup, is stored in the ROM **516**. The computer **500** further includes a mass storage device **510** for storing an operating system **518**, application programs, and other program modules, which will be described in greater detail below.

The mass storage device **510** is connected to the CPU **502** through a mass storage controller (not shown) connected to the bus **504**. The mass storage device **510** and its associated computer-readable media provide non-volatile storage for the computer **500**. Although the description of computer-readable media contained herein refers to a mass storage device, such as a hard disk or CD-ROM drive, it should be appreciated by those skilled in the art that computer-readable storage media can be any available computer storage media that can be accessed by the computer **500**.

By way of example, and not limitation, computer-readable storage media may include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. For example, computer-readable storage media includes, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid state memory technology, CD-ROM, digital versatile disks ("DVD"), HD-DVD, BLU-RAY, or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by the computer **500**. As used herein, the term computer-readable storage media does not encompass transitory signals.

According to various embodiments, the computer **500** may operate in a networked environment using logical connections to remote computers through a network such as the network **520**. The computer **500** may connect to the network **520** through a network interface unit **506** connected to the bus **504**. It should be appreciated that the network interface unit **506** may also be utilized to connect to other types of networks and remote computer systems. The computer **500** may also include an input/output controller **512** for receiving and processing input from a number of other devices, including a keyboard, mouse, or electronic stylus (not shown in FIG. **5**). Similarly, an input/output controller may provide output to a display screen, a printer, or other type of output device (also not shown in FIG. **5**).

As mentioned briefly above, a number of program modules and data files may be stored in the mass storage device **510** and RAM **514** of the computer **500**, including an operating system **518** suitable for controlling the operation of a networked desktop, laptop, or server computer. The mass storage device **510** and RAM **514** may also store one or more program modules. In particular, the mass storage device **510** and the RAM **514** may store the PIM client application **104**, the CRM plug-in **108**, the Web browser **106**, and the other program modules described above with respect to FIG. **1**. The mass storage device **510** and RAM **514** may also store other program modules and data.

In general, software applications or modules may, when loaded into the CPU **502** and executed, transform the CPU **502** and the overall computer **500** from a general-purpose computing system into a special-purpose computing system customized to perform the functionality presented herein. The CPU **502** may be constructed from any number of transistors or other discrete circuit elements, which may individually or collectively assume any number of states. More specifically, the CPU **502** may operate as one or more finite-state machines, in response to executable instructions contained within the software or modules. These computer-executable instructions may transform the CPU **502** by specifying how the CPU **502** transitions between states, thereby physically transforming the transistors or other discrete hardware elements constituting the CPU **502**.

Encoding the software or modules onto a mass storage device may also transform the physical structure of the mass storage device or associated computer readable storage media. The specific transformation of physical structure may depend on various factors, in different implementations of this description. Examples of such factors may include, but are not limited to: the technology used to implement the computer readable storage media, whether the computer readable storage media are characterized as primary or secondary storage, and the like. For example, if the computer readable storage media is implemented as semiconductor-based memory, the software or modules may transform the physical state of the semiconductor memory, when the software is encoded therein. For example, the software may transform the states of transistors, capacitors, or other discrete circuit elements constituting the semiconductor memory.

As another example, the computer readable storage media may be implemented using magnetic or optical technology. In such implementations, the software or modules may transform the physical state of magnetic or optical media, when the software is encoded therein. These transformations may include altering the magnetic characteristics of particular locations within given magnetic media. These transformations may also include altering the physical features or characteristics of particular locations within given optical media, to change the optical characteristics of those locations. Other transformations of physical media are possible without departing from the scope and spirit of the present description, with the foregoing examples provided only to facilitate this discussion.

Based on the foregoing, it should be appreciated that technologies for integrating a Web-based CRM system and a PIM client application have been presented herein. Although the subject matter presented herein has been described in language specific to computer structural features, methodological acts, and computer readable media, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features, acts, or media described herein. Rather, the specific features, acts and storage mediums are disclosed as example forms of implementing the claims.

The subject matter described above is provided by way of illustration only and should not be construed as limiting. Various modifications and changes may be made to the subject matter described herein without following the example embodiments and applications illustrated and described, and without departing from the true spirit and scope of the present invention, which is set forth in the following claims.

What is claimed is:

1. A computer-implemented method comprising:

retrieving from a customer relationship management (CRM) system user interface (UI) definitions defining a UI control to be provided through a Web-based UI of the CRM system;

generating a personal information management (PIM) UI by identifying the UI control to be provided by a PIM client application in a CRM UI based upon the UI definitions;

integrating the Web-based UI provided by the CRM system within the PIM UI based on the UI definitions provided by the CRM system;

rendering the PIM UI in the PIM client application;

instructing a device to display the identified UI control in the PIM UI;

receiving a selection of the UI control displayed in the PIM UI; and

in response to receiving the selection of the UI control in the PIM UI, executing UI code for implementing the selection of the UI control, wherein the UI code is utilized by the CRM system to implement a Web-based UI control when a CRM UI control is selected.

2. The computer-implemented method of claim **1**, further comprising:

retrieving a form definition from the CRM system, the form definition defining CRM fields to be provided in a form generated by the Web-based UI provided by the CRM system; and

instructing the device to display the CRM fields in the CRM UI.

3. The computer-implemented method of claim **2**, further comprising:

identifying a subset of the CRM fields defined by the form definition that do not overlap with a set of fields natively displayed by the PIM client application,

and wherein displaying the CRM fields in the UI provided by the PIM client application comprises displaying the subset of the CRM fields in the CRM UI.

4. The computer-implemented method of claim **1**, wherein the UI definitions define pre-defined UI controls and user-defined UI controls.

5. The computer-implemented method of claim **1**, wherein identifying UI controls to be provided by the PIM client application based upon the UI definitions comprises identifying a subset of the UI controls defined by the UI definitions.

6. The computer-implemented method of claim **3**, further comprising:

retrieving validation code for validating data input into the CRM fields, wherein the validation code is utilized by the CRM system for validating data input into forms generated by the Web-based UI provided by the CRM system; and

executing the validation code for validating data input into the CRM fields displayed by the PIM client application.

7. The computer-implemented method of claim **6**, wherein the validation code is further configured to validate input made to the set of fields natively displayed by the PIM client application.

8. The computer-implemented method of claim **7**, wherein the form comprises an electronic mail (e-mail) message, and wherein the UI controls correspond to functions for one or more of inserting a template into the e-mail message, inserting a knowledgebase article into the e-mail message, or inserting literature into the e-mail message.

9. The computer-implemented method of claim **8**, wherein the UI controls further correspond to functions for one or more of: tracking the e-mail message in the CRM system, viewing an object corresponding to the e-mail message in the CRM system, converting the e-mail message to an activity in the CRM system, or adding a connection on the CRM system.

10. The computer-implemented method of claim **8**, wherein the UI controls further correspond to functions for one or more of: tracking a meeting in the CRM system, viewing an object corresponding to the meeting in the CRM system, or converting a meeting to an activity in the CRM system.

11. A computer-readable storage medium having computer-executable instructions stored thereupon which, when executed by a computer, cause the computer to:

retrieve a form definition from a customer relationship management (CRM) system, the form definition defining CRM fields to be provided in a form generated by a Web-based user interface (UI) of the CRM system;

instruct a device to display the CRM fields in a UI provided by a personal information management (PIM) client application;

retrieve UI definitions from the CRM system, the UI definitions defining UI controls to be provided through the Web-based UI provided by the CRM system;

generate the PIM UI by identifying UI controls to be provided in the UI provided by the PIM client application in the Web-based CRM UI based upon the UI definitions;

integrate the Web-based UI provided by the CRM system within the PIM UI based on the UI definitions provided by the CRM system;

render the PIM UI in the PIM client application;

instruct the device to display the identified UI controls in the PIM UI;

receive a selection of a UI control displayed in the PIM UI; and

in response to receiving the selection of the UI control in the PIM UI, execute UI code for implementing the selection of the UI control, wherein the UI code is utilized by the CRM system to implement a Web-based UI control when a CRM UI control is selected.

12. The computer-readable medium of claim **11**, having further computer-executable instructions stored thereupon which, when executed by the computer, will cause the computer to:

receive a selection of the UI control displayed in the Web-based CRM UI; and

in response to receiving the selection of the UI control, execute UI code for implementing the selection of the UI control, and wherein the UI code is utilized by the CRM system to implement a Web-based UI control when the Web-based UI control is selected in the Web-based UI provided by the CRM system.

13. The computer-readable storage medium of claim **12**, having further computer-executable instructions stored thereupon which, when executed by the computer, will cause the computer to:

identify a subset of the CRM fields defined by the form definition that do not overlap with a set of fields natively displayed by the PIM client application,

and wherein displaying the CRM fields in the Web-based CRM UI comprises displaying the subset of the CRM fields in the Web-based CRM UI.

14. The computer-readable storage medium of claim **12**, wherein identifying the UI controls to be provided by the PIM client application based upon the UI definitions comprises identifying a subset of the UI controls defined by the UI definitions.

15. The computer-readable storage medium of claim **12**, wherein the UI definitions define pre-defined UI controls and user-defined UI controls.

16. The computer-readable storage medium of claim **12**, having further computer-executable instructions stored thereupon which, when executed by the computer, will cause the computer to:

retrieve a validation code for validating data input into the CRM fields, wherein the validation code is utilized by the CRM system for validating data input into forms generated by the Web-based UI provided by the CRM system; and

execute the validation code for validating data input into the CRM fields displayed by way of the PIM client application.

17. A computer, comprising:

a processor; and

a computer-readable storage medium in communication with the processor, the computer-readable storage medium having instructions stored thereupon that, when executed by the processor, cause the processor to

retrieve user interface (UI) definitions from a customer relationship management (CRM) system, the UI definitions defining UI controls to be provided through a Web-based UI of the CRM system,

identify UI controls to be provided by a personal information management (PIM) client application in the Web-based CRM UI based upon the UI definitions,

retrieve a form definition from the CRM system, the form definition defining CRM fields to be provided in a form generated by the Web-based UI provided by the CRM system,

integrate the Web-based UI provided by the CRM system within a PIM UI based on the UI definitions provided by the CRM system,

render the PIM UI in the PIM client application,

transmit to a display the identified UI controls and the CRM fields in the PIM UI,

retrieve a validation code for validating data input into the CRM fields, wherein the validation code is utilized by the CRM system for validating the data input into forms generated by the Web-based UI provided by the CRM system,

execute the validation code for validating the data input into the CRM fields displayed by the PIM client application,

receive a selection of a UI control displayed in the PIM UI, and

in response to receiving the selection of the UI control in PIM UI, execute UI code for implementing the selection of the UI control, wherein the UI code is utilized by the CRM system to implement a Web-based UI control when a CRM UI control is selected.

18. The computer of claim **17**, wherein the form comprises an electronic mail (e-mail) message, and wherein the UI controls correspond to functions for

inserting a template into the e-mail message,

viewing an object corresponding to the e-mail message in the CRM system,

converting the e-mail message to an activity in the CRM system, and

tracking the e-mail message in the CRM system.

19. The computer of claim **17**, wherein the validation code is further configured to validate input made to a set of fields natively displayed by the PIM client application.

20. The computer of claim **17**, wherein the UI definitions define pre-defined UI controls and user-defined UI controls.

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